Morphologic and Morphometric Evidence for Active Tectonic Effects on Alluvial Fans in North Damghan

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Extended Abstract

Introduction

When a river reaches from high gradient mountains to a low gradient plain, aggradations phenomenon is occurred and alluvial fans are built. At least five factors influence fan processes, including catchment bedrock lithology, catchment shape, neighboring environments, climate, and tectonics. Rocks of differing lithology yield contrasting sediment suites and volumes due to their variable response to weathering. Bedrock in desert settings is optimal for fan development, especially tectonically maintained mountain fronts, yields sediment in varying size. The volume depends on: (a) the style of fracturing in proximity to faults, (b) the presence or absence of internal discontinuities such as bedding planes or foliation planes, and (c) the reaction to chemical weathering and non-tectonic types of physical weathering. Aeolian, fluvial, volcanic, lacustrine, or marine environments that border alluvial fans can impact fan processes by modifying the conditions of deposition. Fluvial environments, usually in the form of longitudinally oriented rivers, may affect fans by eroding their distal margins. Climate and its fluctuations affect water supply and vegetation cover. Without continued tectonics, fans may become minor or short-lived features. In this study, the evidence and impacts of the active faults

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are investigated in 16 alluvial fans morphometry and morphology located at the north part of the city of Damghan.

Methodology
The method is based on the obtained qualitative and quantitative data. The quantitative data includes satellite image interpretation and digital elevation models, alluvial fan morphometry, channel displacement and rate of sediment uplift. Super imposed profiles techniques, longitudinal and cross profile and gradient analysis were used to interpret the active fault effects on alluvial fans. Topography maps (1:25000), aerial photos (1:55000), ETM satellite image with 30 m spatial resolution, 8 bands, geology maps (1:100000) and digital elevation models (50m pixel resolution) were utilized in this study. Also, field work for investigation of evidence of faults activities were performed in two stages.

Results and Discussion
This area is located between two geo-structural zones. Alborz zone in the north and central Iran zone in the south. There are two main faults in this area. Tazareh fault is located at Alborz mountain front and affects the apex of alluvial fans, whereas Damghan fault is located far from mountain front. Distance between these faults is about 5 km. Tazareh fault has caused the displacement of the main channel in fan apex, and therefore has changed the sedimentation position; while evidence of Damghan fault activities are more, and has caused uplifting surfaces, derelict of fan surface, change of intersection point, uplift of fan sediment and lateral change of fan surface channels. The slope of most alluvial fans is 2-5 degree, except for fan No. 7 that is less than 2 degree. This fan is the largest fan in the study area. The lower gradient may be contributed to its large drainage basin. Damghan fault activities have caused alluvial fan deposits uplifted about 10 m.

Conclusion
The findings showed that Tazareh and Damghan faults were active in quaternary epoch and position of alluvial fans was affected by activities of these faults. Faults have had either lateral or vertical displacements. Findings showed that the slope of all alluvialfans (except for fan number 7) increased suddenly in the apex of fans. Therefore the longitudinal profiles of alluvial fans are in a concaved shape. This means that tectonic activities affect the evolution of alluvial fans in quaternary epoch. Investigations show that there is no statistical correlation among the variables that affect the alluvial fans. Generally, tectonic activities disrupt natural evolution of alluvial fans. Each fault has a different effect on alluvial fan evolution. Tazareh fault has caused the displacement of the main channel to the east of fan apex and has increased slope of this part. Damghan fault has caused uplift of fan deposits, change the intersection point and reconstruction of new alluvial fans in the lower of this point. Accommodation space of alluvial fans from Siahkooh to Roodbar has affected by Damghan fault activities. Indeed, uplift of this part of fault has limited accommodation space for alluvial fans growth. There are a correlation
between number of uplifted surface of alluvial fans, number of uplifted playa sediments (clay and silt) and number of channel displacements; this means that Damghan fault experienced three separate activities in quaternary epoch.

Keywords: Active Tectonics, Alluvial fan, Active fault, Morphometry, Damghan.